

Fig. 1

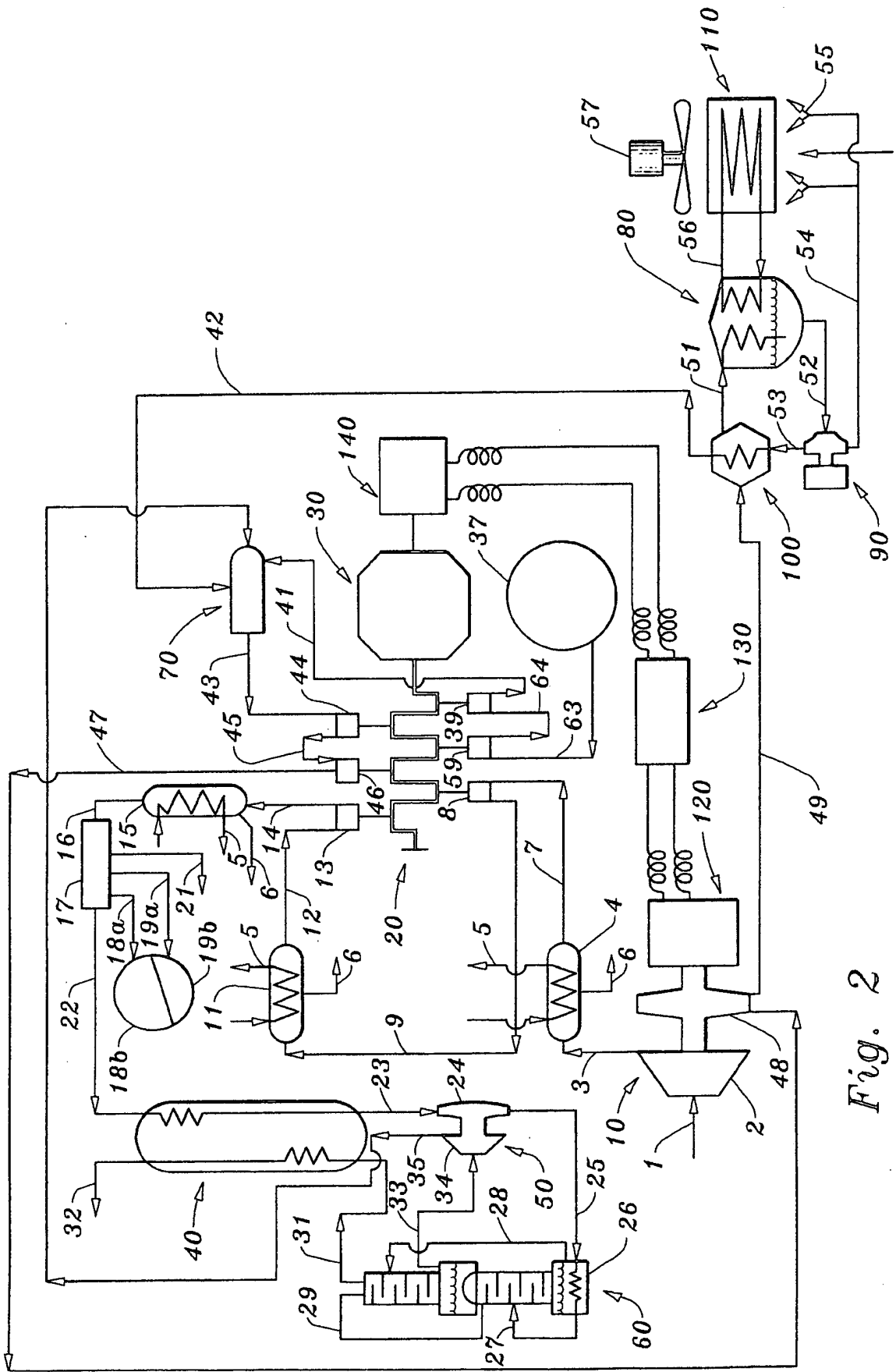
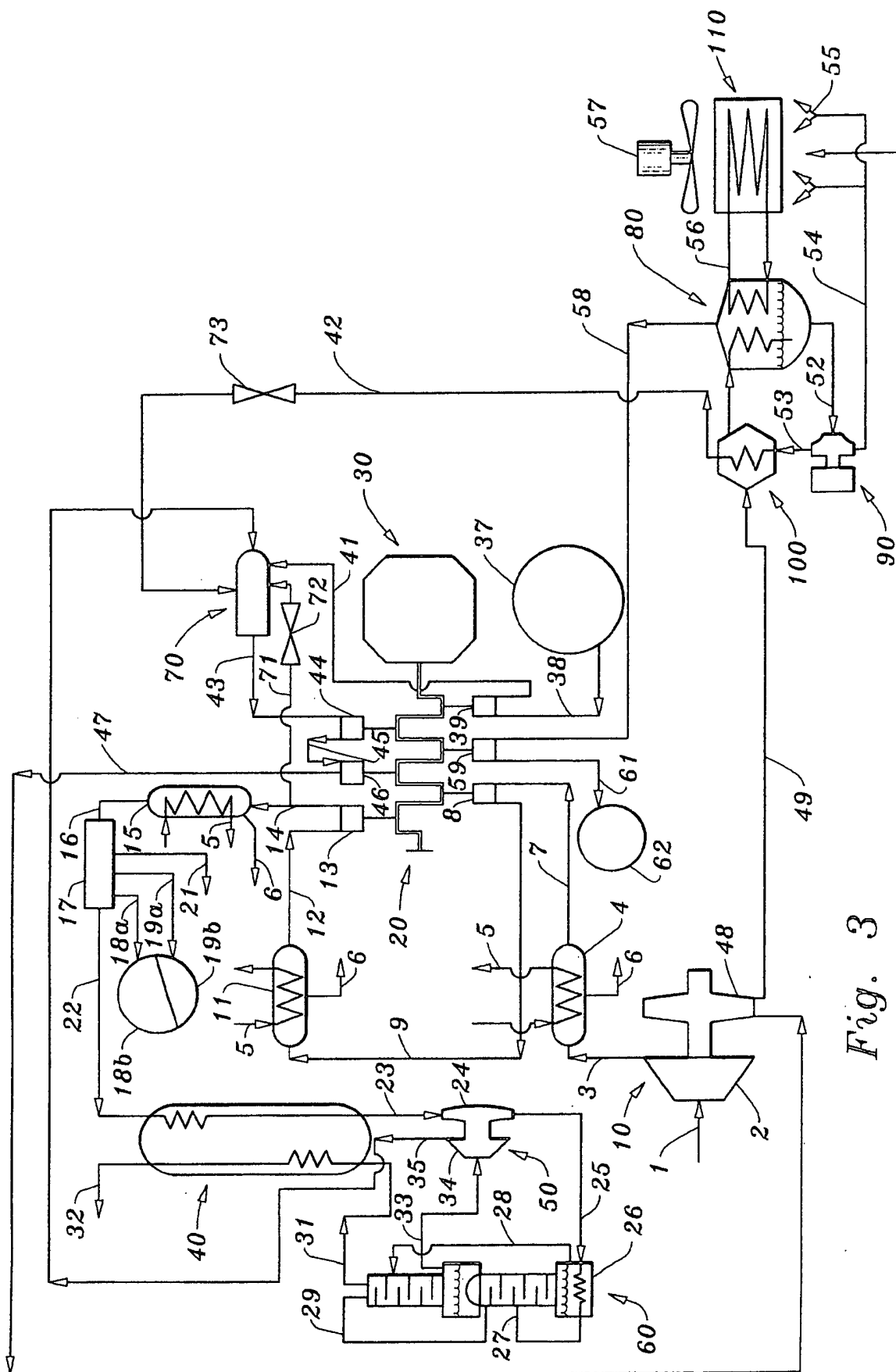


Fig. 2



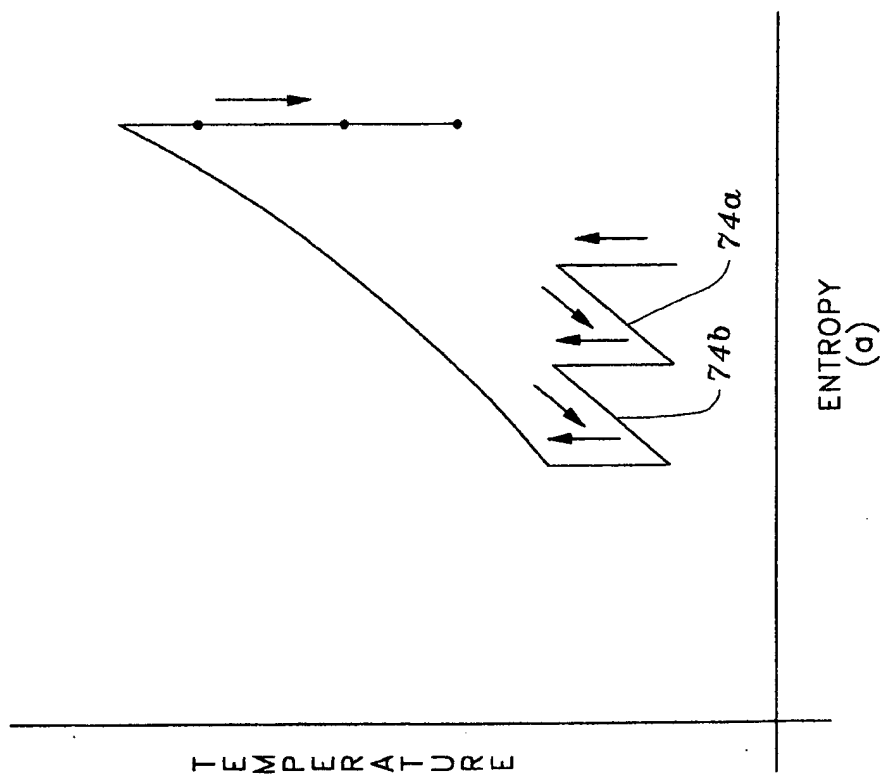


Fig. 4

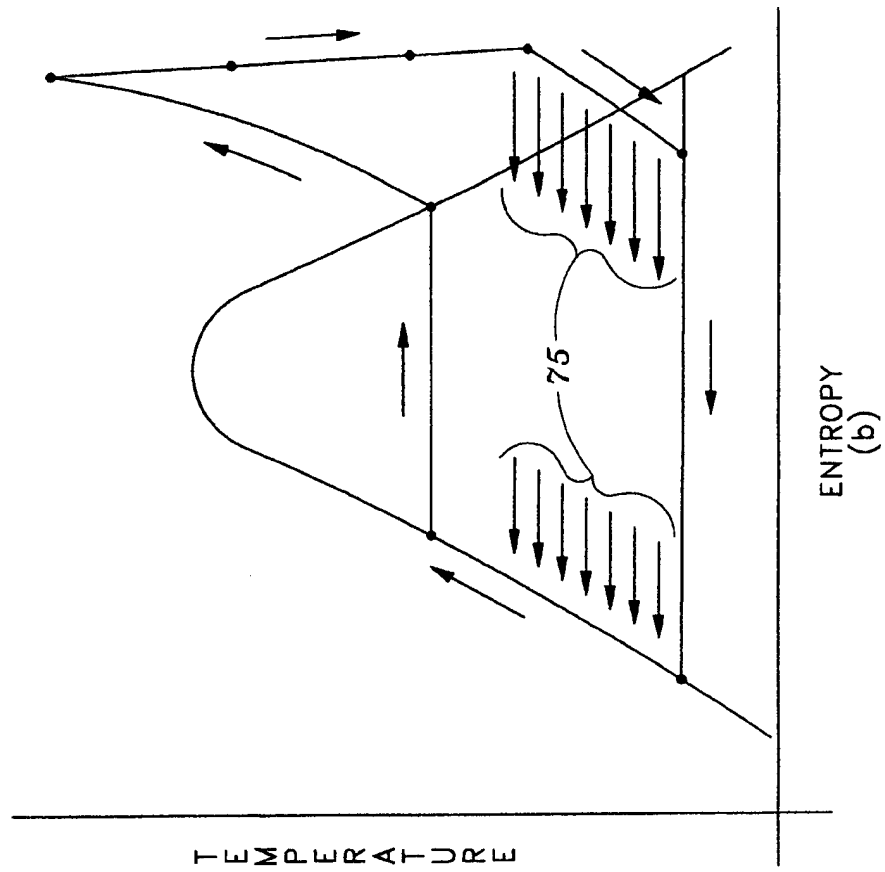


Fig. 5

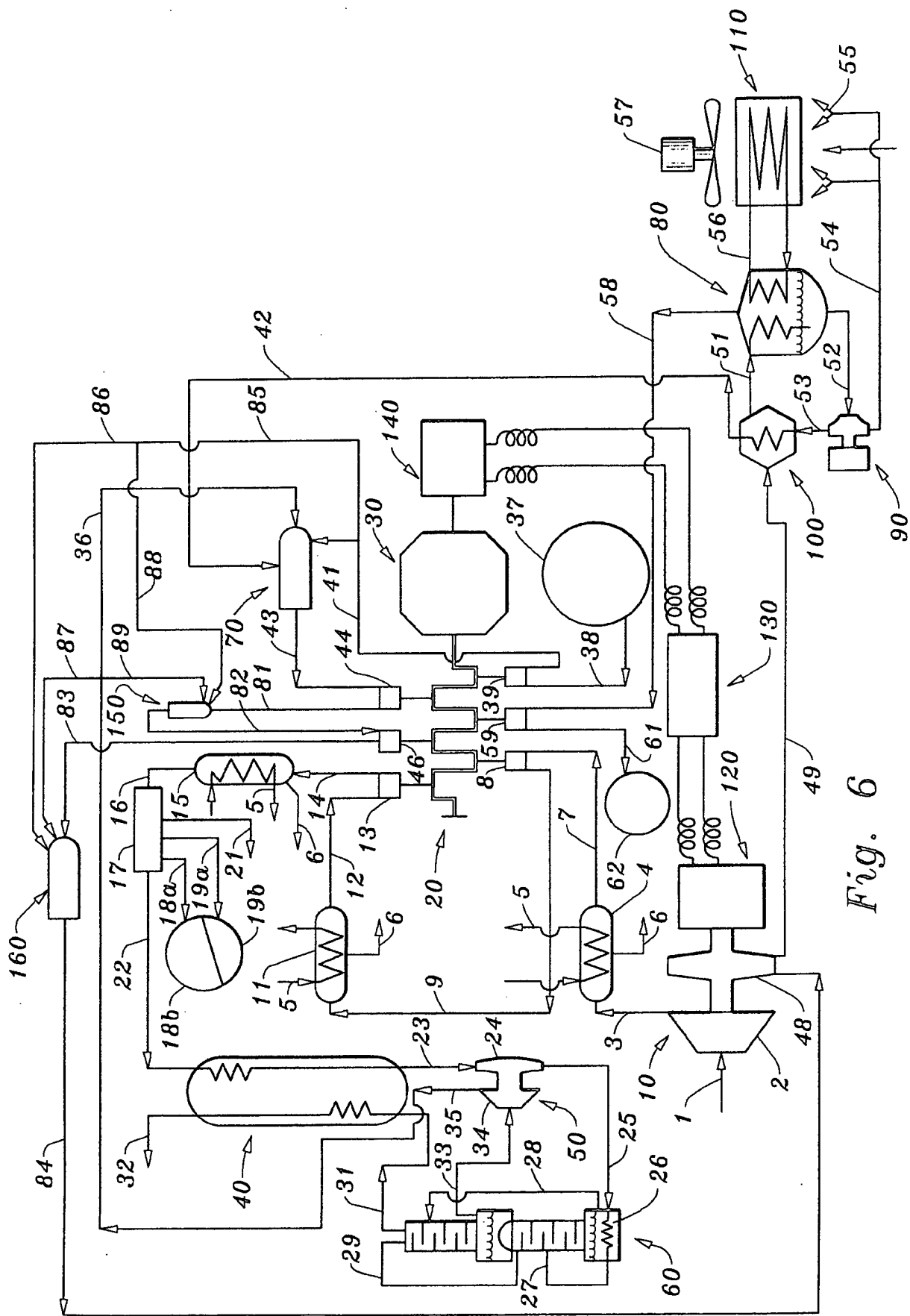


Fig. 6

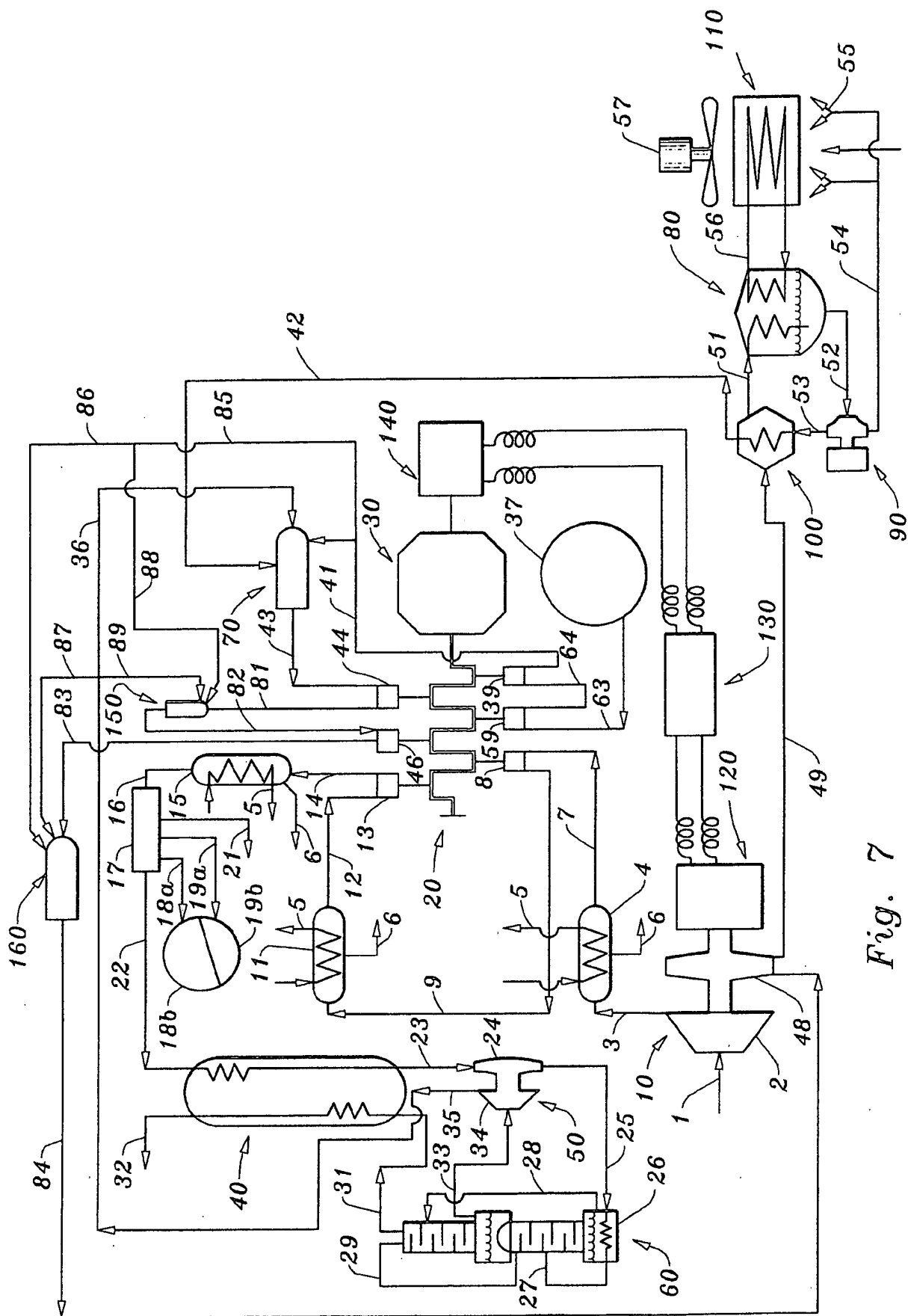
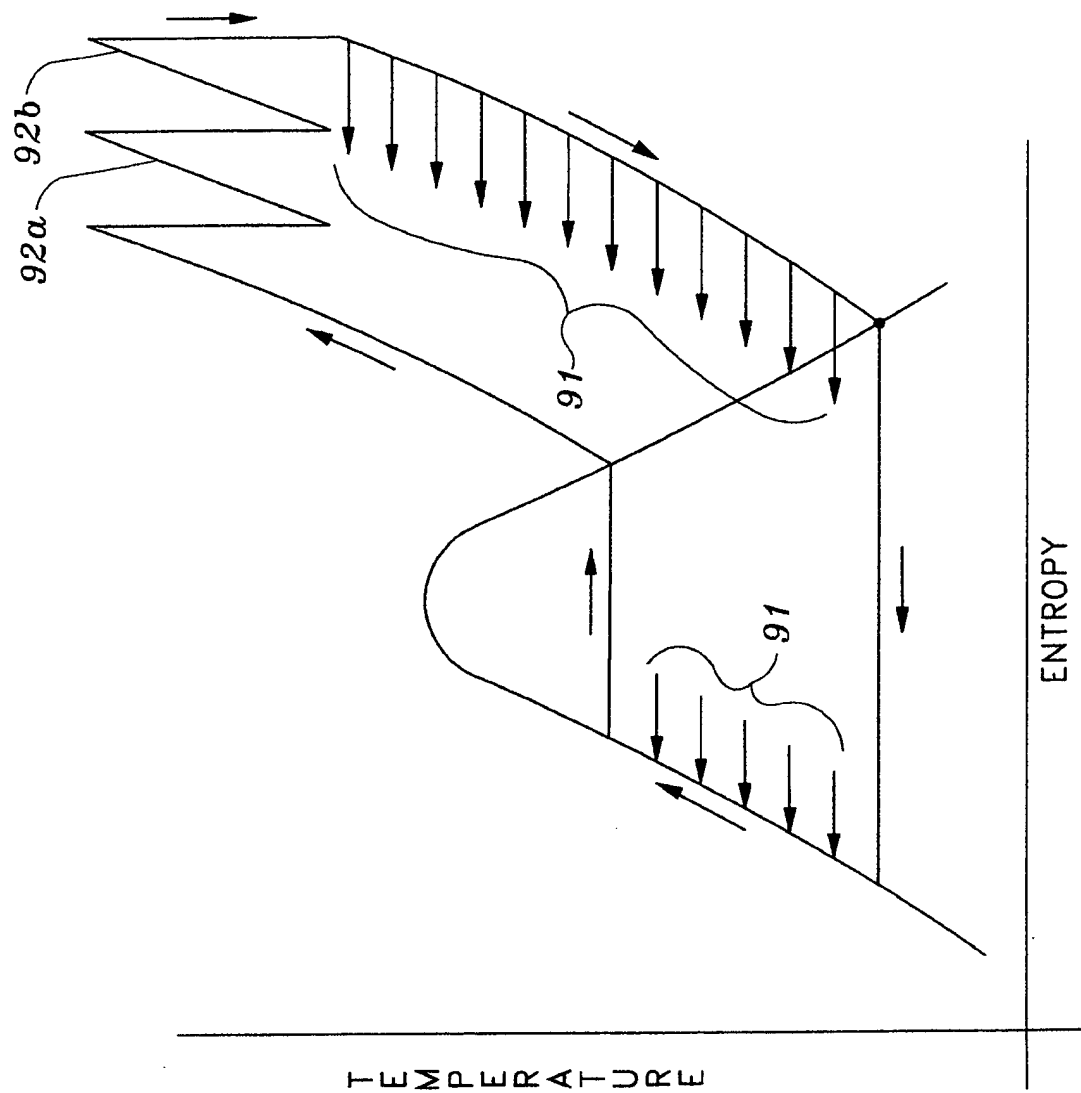


Fig. 7



ENTROPY

Fig. 8

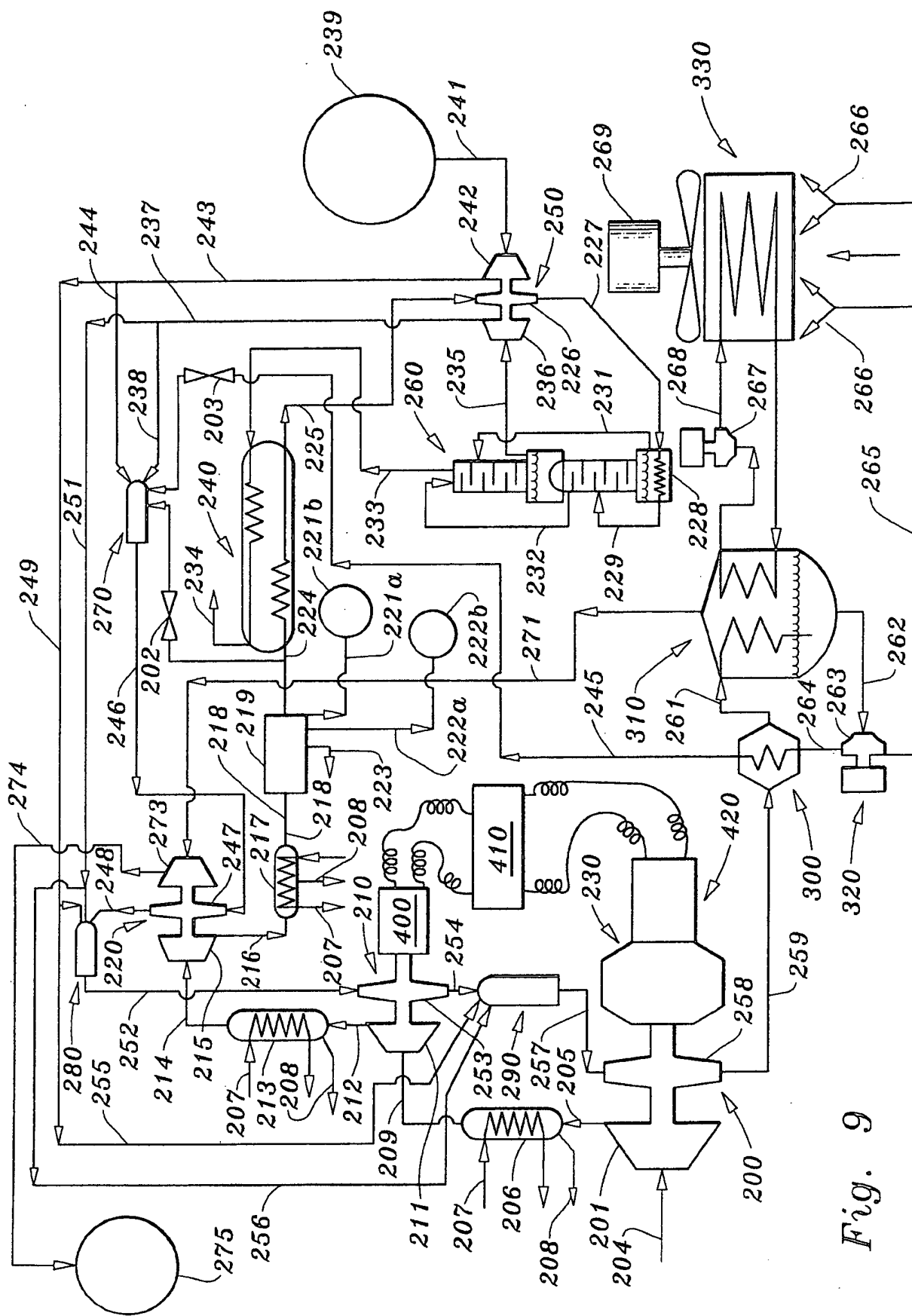


Fig. 9

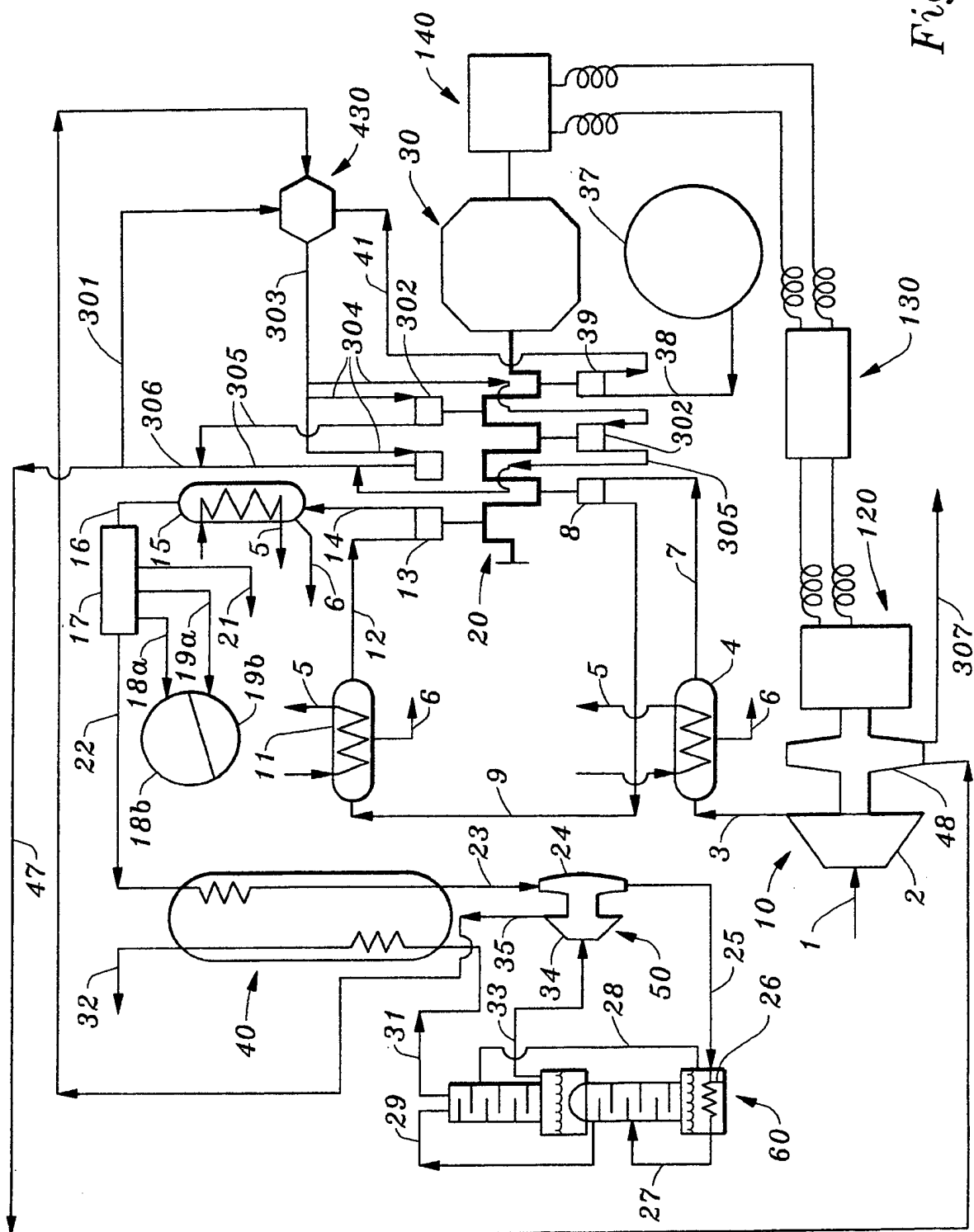


Fig. 10

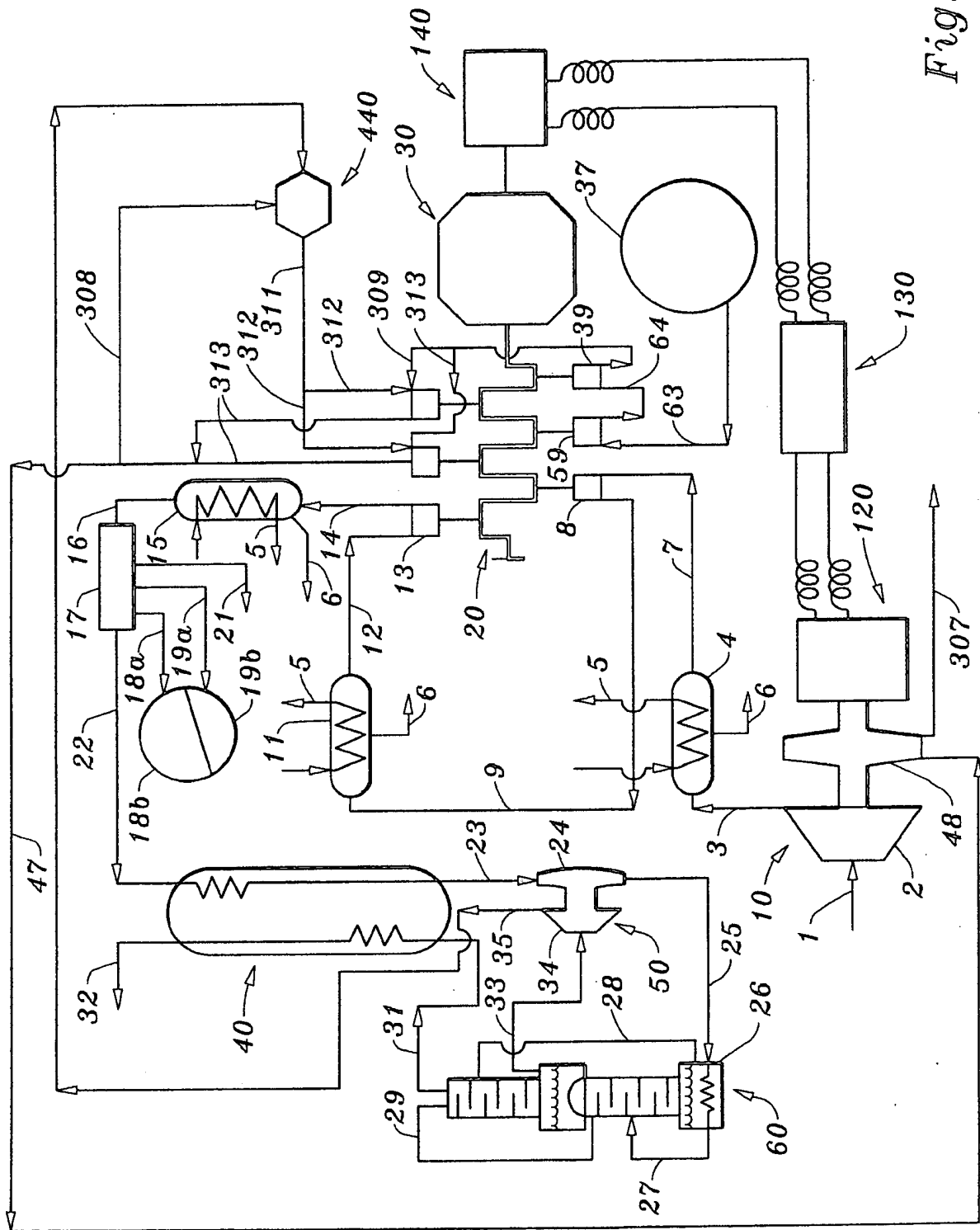


Fig. 11

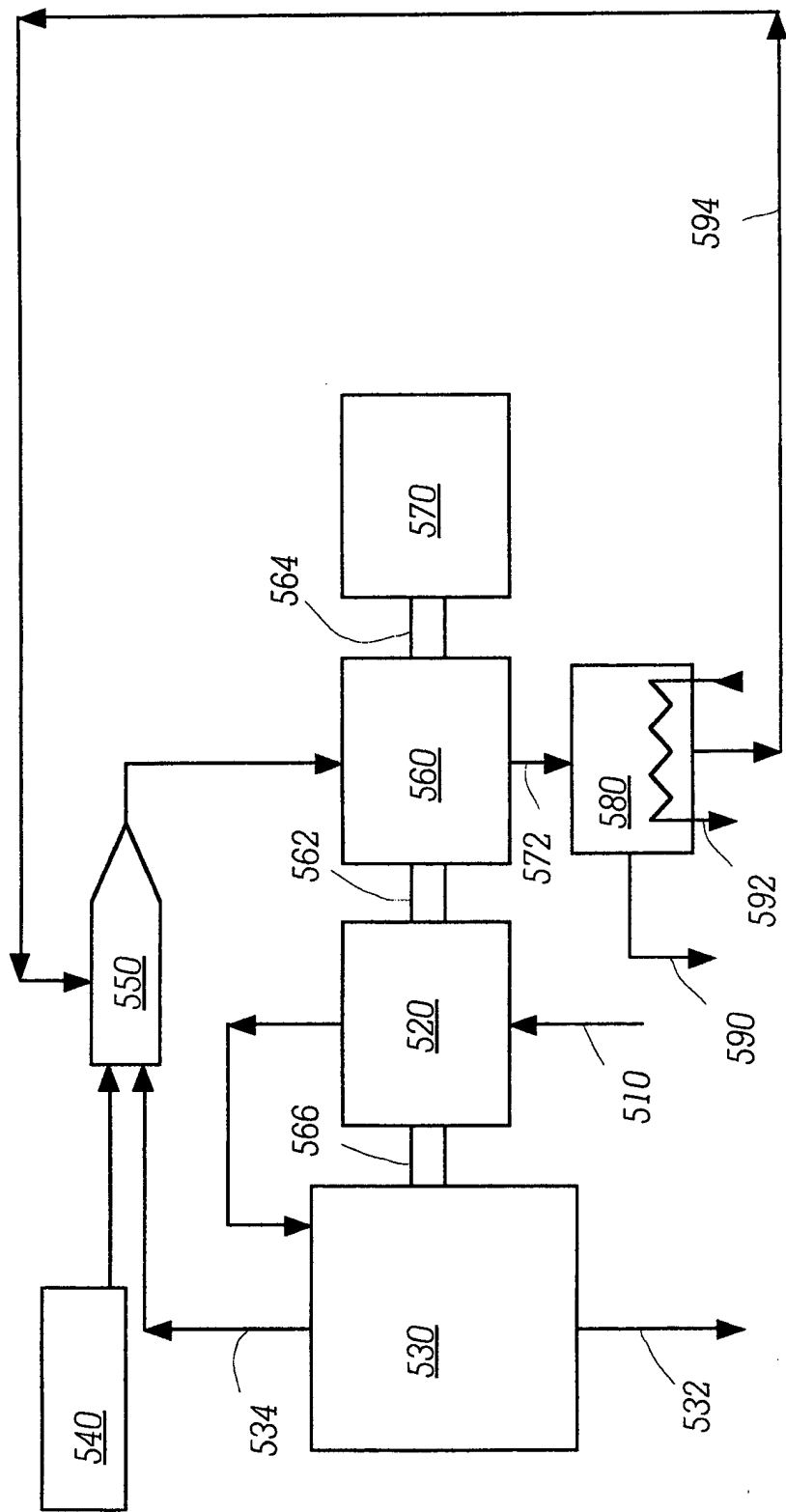


Fig. 12

500

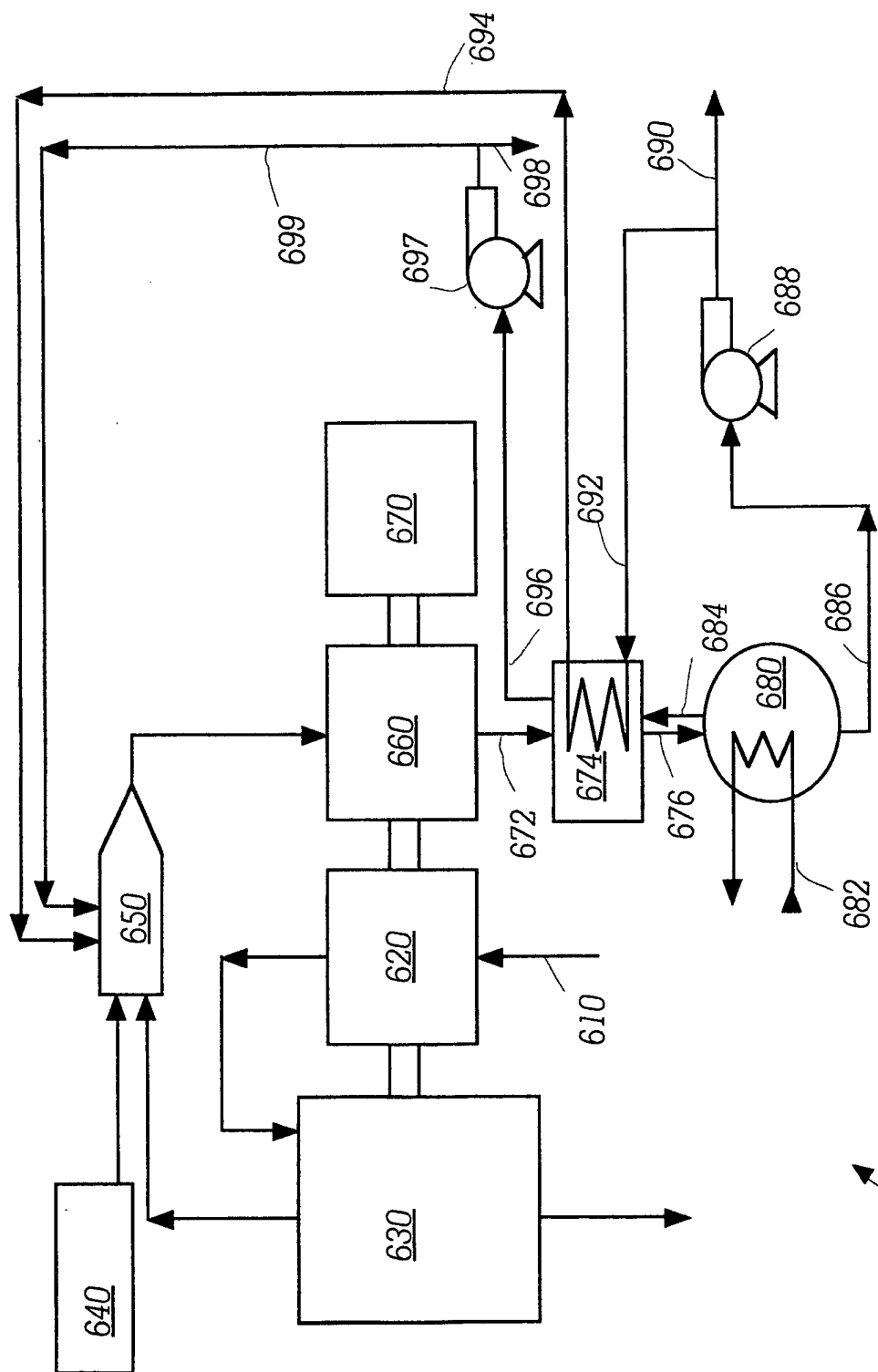


Fig. 13

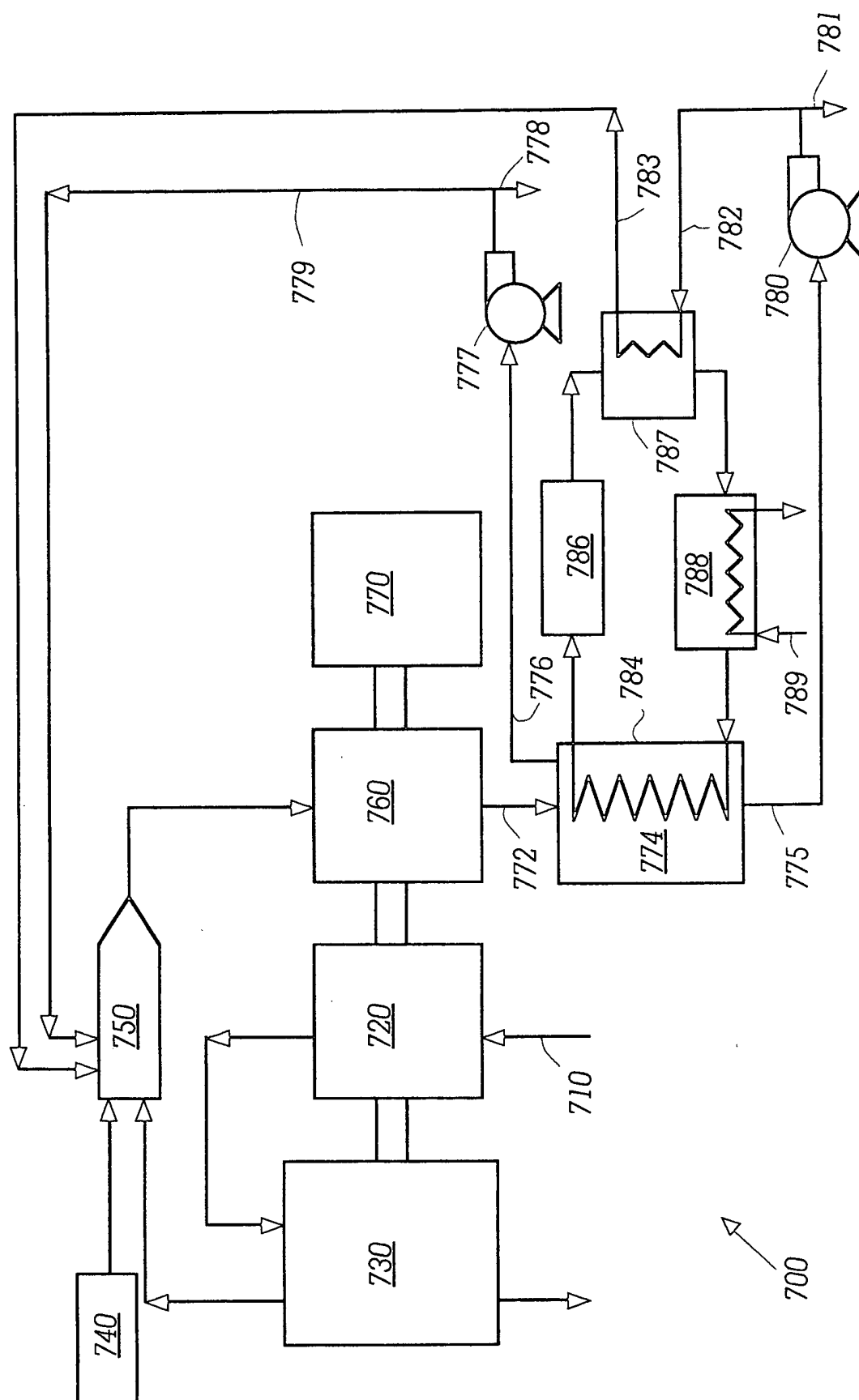


Fig. 14

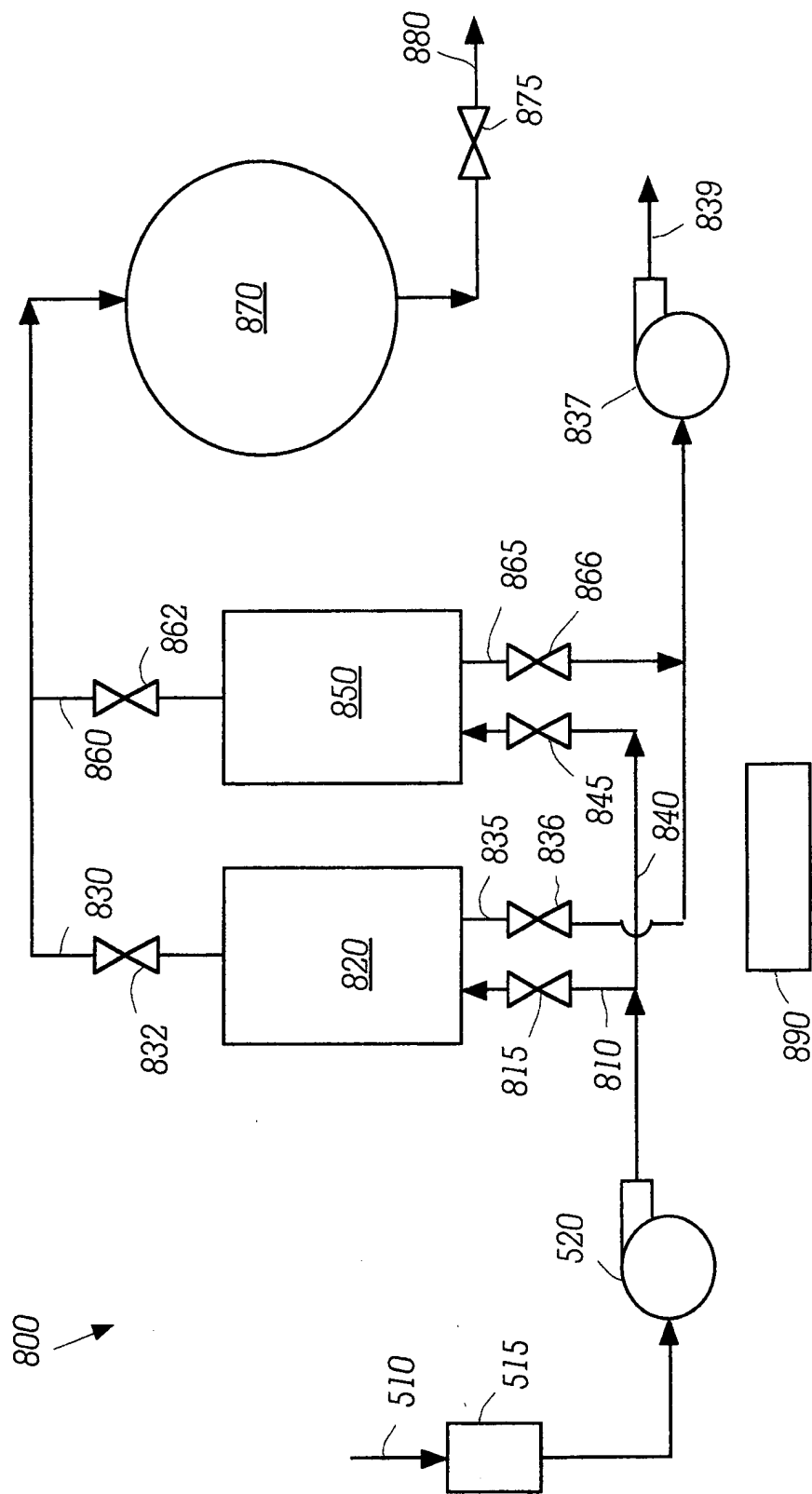


Fig. 15

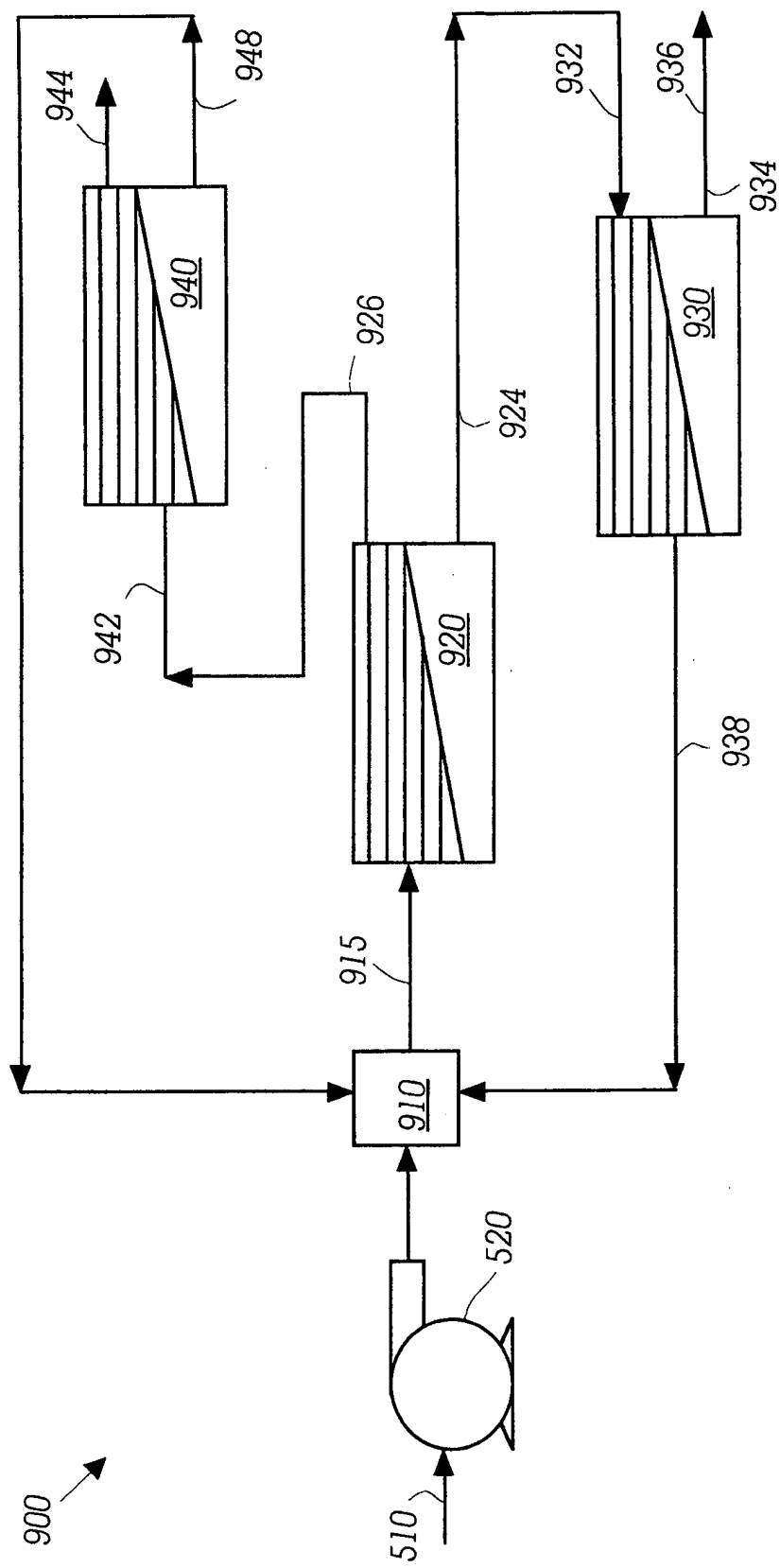


Fig. 16

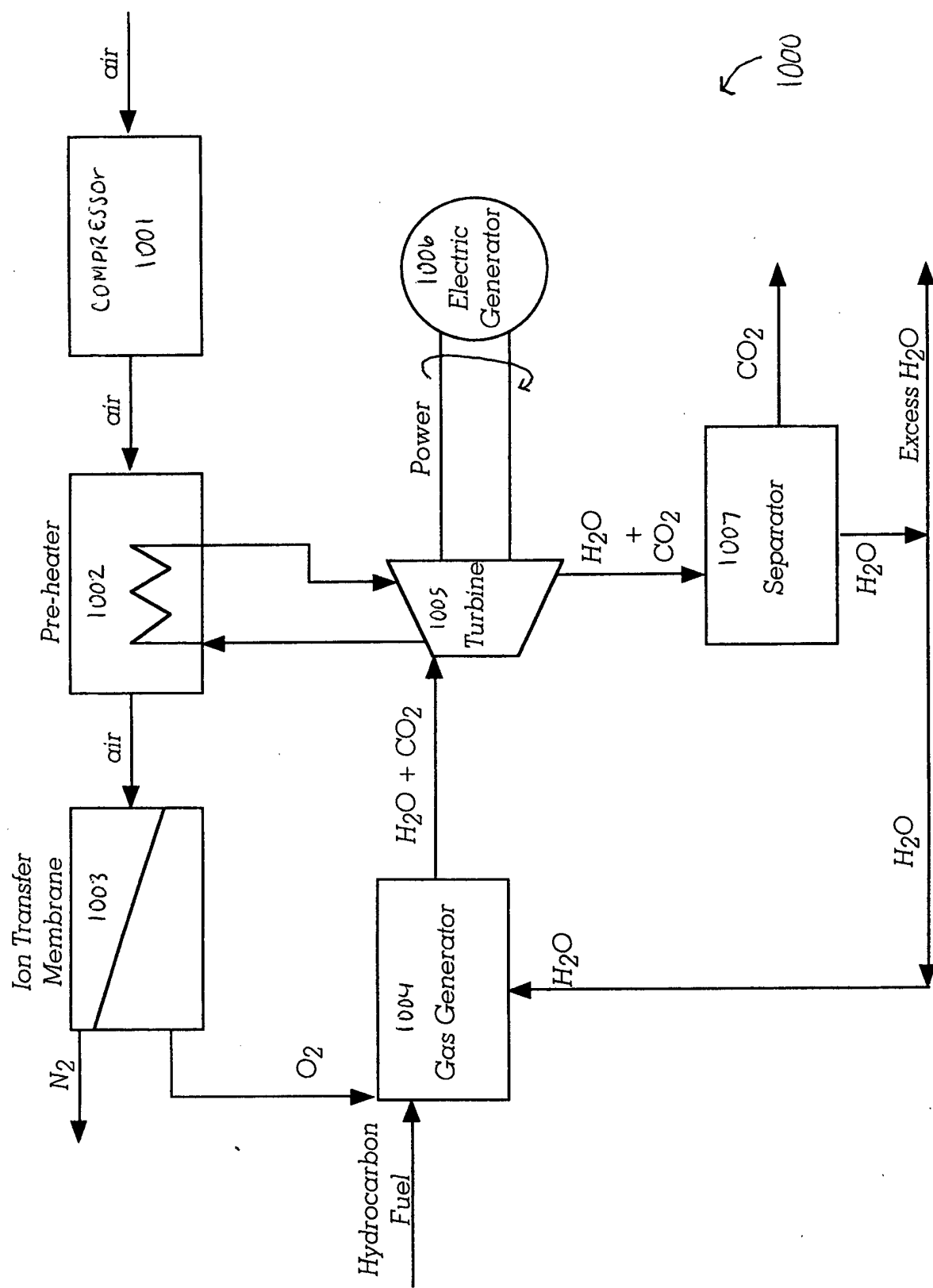


Fig. 17

INTEGRATED CES POWER PLANT WITH ION TRANSFER MEMBRANE OXYGEN SEPARATION PLANT

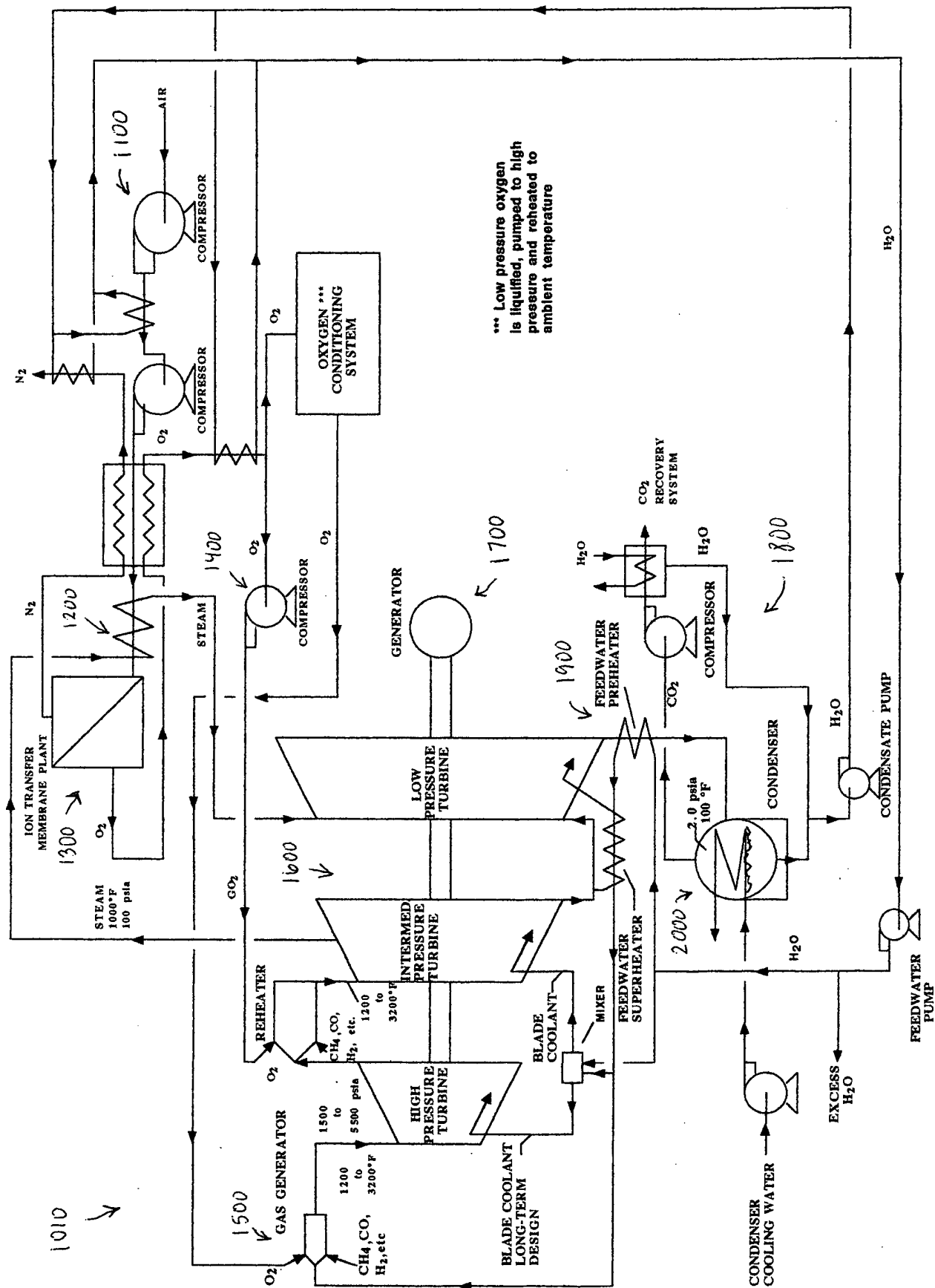
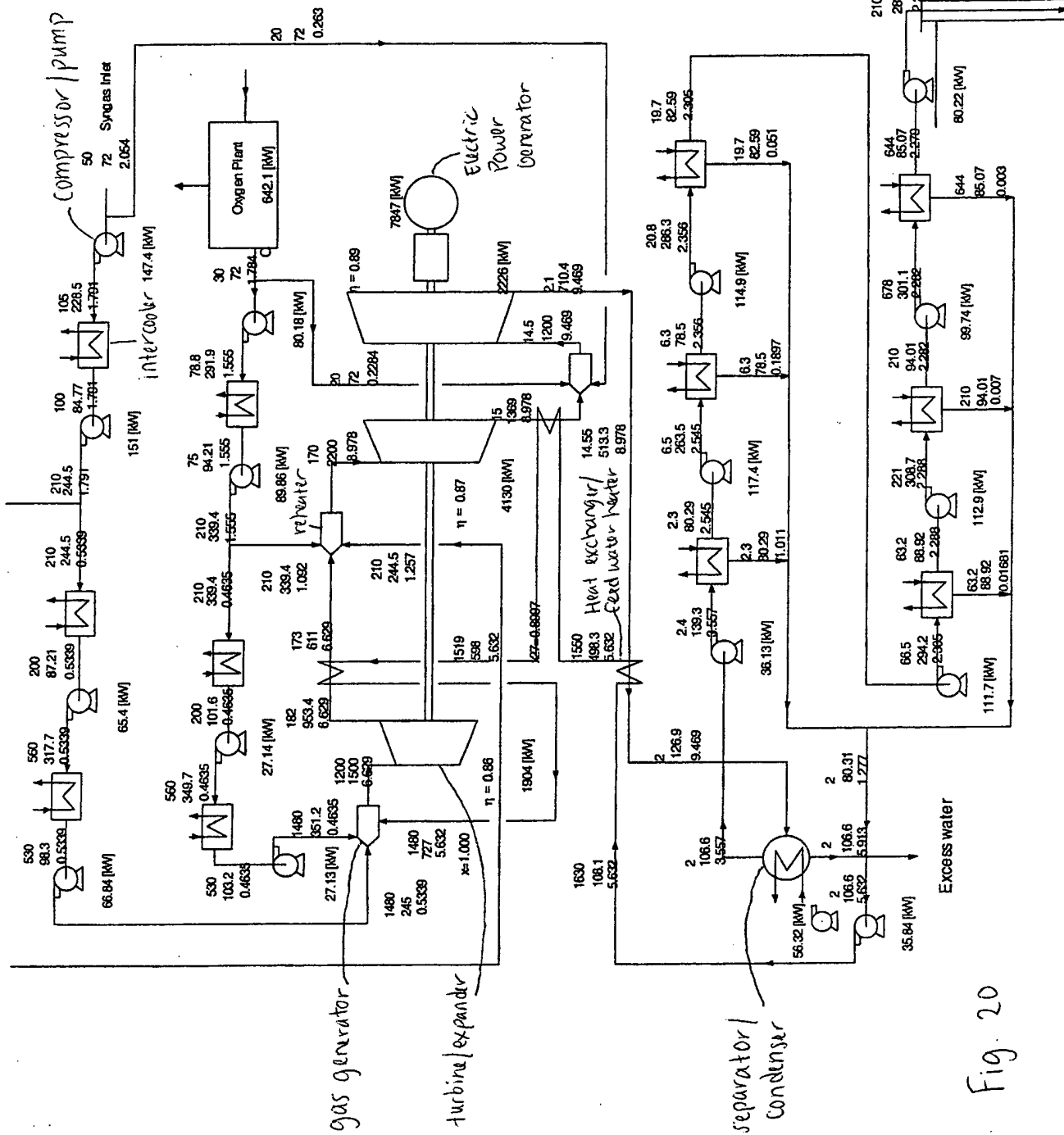


Fig. 18



Input power = 12707 [kW] LHV Electrical power generated = 7847 [kW] Parasitic power = 2132 [kW] Net electrical power = 5715 [kW]

LHV thermal efficiency = 0.4497

Power Plant Operating on Syngas and with Two Reheaters.

Upper Number – Pressure in lb/in², Middle Number – Temperature in °F, Bottom Number – Flow Rate in lb/sec

Calculated Heating Values and Flow Rates of one typical Syn - Gas from a 300 ton/day MSW Gasification System

Wet Basis Composition, Flow Rates, and Heating Values ^[1]										
Component	Flow Rate		Concentration			Heat of Combustion (LHV)			Heat of Combustion (HHV)	
	m ³ /hr ^[2]	kg-mol/hr	kg/hr	% vol	% wt	kJ/kg-mol	kJ/hr	kJ/m ³ (NTP)	kJ/kg-mol	kJ/m ³ (NTP)
H ₂	3463.6	141.567	285.38	57.338	7.657	-241,826	-34,234,736		-285,840	-40,465,625
CO ₂	1067.4	43.628	1920.05	17.670	51.516	0	0		0	0
CO	995.2	40.677	1139.37	16.475	30.570	-282,989	-11,511,081		-282,989	-11,511,081
H ₂ O	444.1	18.152	327.01	7.352	8.774	0	0		-44,014	-798,920
CH ₄	51.7	2.113	33.90	0.856	0.910	-802,320	-1,695,405		-890,347	-1,881,418
N ₂	18.3	0.748	20.95	0.303	0.562	0	0		0	0
C ₂ H ₄	0.4	0.016	0.46	0.007	0.012	-1,322,960	-21,629		-1,410,987	-23,068
Total	6040.7	246.901	3727.12	100.00	100.00		-47,462,852	-7,857.2		-9051.9
							13184.1 kW			15188.9 kW

Dry Basis Composition, Flow Rates, and Heating Values ^[1]										
Component	Flow Rate		Concentration			Heat of Combustion (LHV)			Heat of Combustion (HHV)	
	m ³ /hr ^[2]	kg-mol/hr	kg/hr	% vol	% wt	kJ/kg-mol	kJ/hr	kJ/m ³ (NTP)	kJ/kg-mol	kJ/m ³ (NTP)
H ₂	3463.6	141.567	285.38	61.888	8.393	-241,826	-34,234,736		-285,840	-40,465,625
CO ₂	1067.4	43.628	1920.05	19.072	56.470	0	0		0	0
CO	995.2	40.677	1139.37	17.782	33.510	-282,989	-11,511,081		-282,989	-11,511,081
CH ₄	51.7	2.113	33.90	0.924	0.997	-802,320	-1,695,405		-890,347	-1,881,418
N ₂	18.3	0.748	20.95	0.327	0.616	0	0		0	0
C ₂ H ₄	0.4	0.016	0.46	0.007	0.013	-1,322,960	-21,629		-1,410,987	-23,068
Total	5596.6	228.749	3400.11	100.00	100.00		-47,462,851.82	-8480.7		-9627.5
							13184.1 kW			14967.0 kW

[1] Heating values based upon assumption that all reactants and products enter and leave at 25 °C and 1 atmosphere

[2] Normal temperature and pressure assumed to be 25 °C and 1 atmosphere

Fig. 21